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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

CULBERT, ROBERTS P

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 01/16/2003

4

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/812,553

Applicant(s)

SASAKI, YOSHITAKA 024

Examiner

Roberts Culbert

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 26 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-48 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-33, 36, 38, 40, 42, 43-47 and 48 is/are rejected.
- 7) ☒ Claim(s) 1, 6, 17, 25-28 and 34-42 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "expanded portion" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

Claim 1 is objected to because of the following informalities: "narrower" is not clear because the claim does not state what the "first mask" is being compared to. Appropriate correction is required.

Claims 1 and 6 are objected to because of the following informalities: The phrase "with a gap layer in between near and in a recording-medium-facing surface to be faced with a recording medium" is not clear. Appropriate correction is required.

Claim 17 is objected to because of the following informalities: "ion nitride" is not defined. "Iron nitride" is suggested.

Claims 27 and 28 are objected to because of the following informalities: Claims 27 and 28 depend on claim 1 which has no third etching step. It is assumed for the purpose of examination that claims 27 and 28 are intended to modify claim 10.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 26 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The only description of the "expanded portion" occurs in the summary (page 15), where the claim is essentially repeated, and in a brief description on pages 85-86. Neither of the descriptions are adequate to enable one of ordinary skill to understand, make, or use the claimed invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 25, 26, 36, 38 and 40 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding the claims above, the phrase "wherein the case" renders the claim indefinite because it is unclear whether the steps following the phrase are part of the claimed invention or are optional.

Claim 26 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as

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the invention. The description of the location and features of the "expanded portion" is unclear and cannot be determined from the specification.

Claim 42 is rejected 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The third magnetic layer is not patterned and it cannot be determined how the layer is formed with an etching method

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-8, 10-13, 20-24, 27-33, 43, 47, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,791,719 to Kobayashi et al. in view of U.S. Patent 6,329,211 to Terunuma et al.

Terunuma teaches a method of manufacturing a thin film magnetic head including first and second magnetic layers (21) and (22) magnetically coupled to each other and having first and second magnetic poles (210) and (220) which face each other with a gap layer (24) in between near and in a recording medium-facing surface to be faced with a recording medium, a thin film coil portion (23) provided between the two magnetic layers, and an insulating layer (25) for insulating the thin film coil portion from the two magnetic layers, the first magnetic layer

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including a first magnetic layer portion the first magnetic pole and the second magnetic layer portion which covers an area of the thin film coil and is magnetically coupled to the first magnetic layer portion, wherein at least one of a step of forming the first magnetic pole and a step of forming the second magnetic pole includes: a step of forming a magnetic material layer (220); a first etching step of forming a first mask having a narrower width by ion beam etching and simultaneously, etching the magnetic material layer to a depth in an area other than an area where the first mask is formed; and a second etching step of forming at least one of the first and second magnetic poles by selectively etching the magnetic material layer by ion beam etching with the first mask. During the second etching step, at least the first magnetic pole in the first magnetic layer and the second magnetic pole in the second magnetic layer are formed. Also, an area in the gap layer other than an area where the first magnetic pole is formed, is selectively removed by reactive ion etching. See Figure 16, and the corresponding description (Col. 9, Lines 54-59). The first mask is formed so that a plane shape thereof includes at least a portion corresponding to the first magnetic pole in the first magnetic layer portion. Teranuma also teaches that the formation of the first magnetic pole in the first magnetic layer, selective removal of the area in the gap layer other than the area where the first magnetic pole is formed, and formation of the second magnetic pole in the second magnetic layer are continuously performed in a series of steps (Col. 9, Lines 54-59). In the method of Teranuma the ion beam irradiation angle is changed from a first angle of 25-55 degrees to a second angle of 60-80 degrees (Col. 9, lines 1-7), the angle being defined as an angle between the direction of the ion beam and a direction orthogonal to an extending direction of the magnetic material layer. Terunuma does

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not show the use of a mask precursor layer in the formation and patterning of the magnetic layer and does not show reactive ion etching with the magnetic material layer.

Kobayashi does show the required patterning steps in the formation of a thin-film magnetic head. Referring to Fig. 7B, Kobayashi teaches a method of manufacturing a thin film magnetic head including first and second magnetic layers (3) and (7) magnetically coupled to each other and having first and second magnetic poles (3) and (7) which face each other with a gap layer (4) in between near and in a recording medium-facing surface to be faced with a recording medium, a thin film coil portion (5) provided between the two magnetic layers, and an insulating layer (6) for insulating the thin film coil portion from the two magnetic layers, wherein at least one of a step of forming the first magnetic pole and a step of forming the second magnetic pole includes: a step of forming a magnetic material layer (7). The magnetic material layer (7) is deposited by sputtering with a predetermined magnetic material (Col. 3, Lines 13-15). In the formation of the magnetic material layer, Terunuma shows the formation inside a photoresist frame (see Fig. 11) that leaves the magnetic layer patterned over the gap layer. Referring back to Kobayashi (Fig. 4-6), Kobayashi shows an alternative for the formation of the magnetic layer that includes forming a magnetic layer (7A), forming a metal oxide mask precursor pattern on the magnetic layer, and etching a part of the mask precursor pattern (9) by ion beam etching (Col. 3, Lines 45-45). The mask precursor layer is a predetermined inorganic material such as alumina or titania (Col. 3, Lines 26-27). Succeedingly, Kobayashi teaches etching the magnetic material layer to a depth in an area other than an area where the first mask is formed (Col. 3, Lines 60-62). Forming the mask precursor pattern includes a step of forming a mask precursor layer on the magnetic layer (See Fig. 4B),

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and a third etching step of forming the mask precursor pattern by selectively etching the mask precursor layer by reactive ion etching (Col. 3, Lines 32-41). A second photoresist or metal mask having a shape corresponding to a plane shape of the mask precursor pattern is used (Col. 3, Lines 55-60). Although it is not explicitly stated in the reference, it may be assumed that the photoresist or metal mask is patterned and etched in the desired shape, and the photoresist or metal film is removed during etching and patterning as this step is notoriously old and well known in the art. Further, it is clear that if the photoresist or metal film were not removed in the well-known manner, the layer would be shown in Figure 5B of Kobayashi. However, Kobayashi does not show that the mask and magnetic layer are narrowed and does not show the simultaneous etching of the mask precursor layer and the magnetic layer.

It would have been obvious to one of ordinary skill in the art at the time of invention to narrow the width of the magnetic poles in Kobayashi using the ion milling technique disclosed in Terunuma in order to enable high-density recording. Further, it would have been obvious to etch the mask precursor layer and magnetic layer simultaneously. A person having ordinary skill in the art would have been motivated to combine etching steps in order to reduce production time and lower production costs.

Regarding the use of reactive ion etching with the magnetic layer, Kobayashi teaches the use of reactive ion etching for the mask precursor layer, and the magnetic layer (Col. 4, Lines 10-15). Kobayashi also comments that the type of etching used is selected primarily on the type of material used (Col. 3, Lines 25-40). In this case, alumina is used as the mask precursor and therefore reactive ion milling is appropriate. Teranuma teaches that etching may be performed using reactive ion etching as well as ion beam etching (Col. 3, Lines 19-21). It would have

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been obvious to one of ordinary skill in the art at the time of invention to use either reactive ion etching or ion beam etching or a combination (reactive ion milling) as suggested by Kobayashi as a matter of selection from the well-known etching methods in the art.

Regarding Claim 21, a layer deposited by chemical vapor deposition is an art-recognized equivalent method for forming a layer as sputtering is shown in Kobayashi. It would have been obvious to one of ordinary skill in the art at the time of invention to use one of the known methods to form the layer.

Regarding claim 22, it would have been obvious to one of ordinary skill in the art at the time of invention to deposit the layer under a pressure of 100 Pa or lower in order to reduce the etch time in the well-known manner.

Regarding claims 27, 28, 47, and 48, it would have been obvious to one of ordinary skill in the art at the time of invention to perform the etching in a gas atmosphere containing at least one of chlorine, boron trichloride, hydrogen chloride, carbon tetrafluoride, sulfur hexafluoride, and boron tribromide as well as a temperature in a range from 50 degree to 300 degrees. as these gasses and temperatures are widely known and used in the etching art for the purpose of dry etching selected areas of a magnetic head. Changes in temperature, concentrations, or other process conditions of an old process, do not impart patentability unless the recited changes are critical, i.e., they produce a new and unexpected result. *In re Aller et al.*, 105 USPQ 233.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,791,719 to Kobayashi et al. in view of U.S. Patent 6,32,211 to Terunuma et al. and in further view of U.S. Patent 6,183,656 to Ide et al.

Regarding claim 9, the step of polishing the surface of the magnetic material layer so as to planarize the surface thereof is well-known in the art as shown by the reference and would have been obvious to one of ordinary skill in the art at the time of invention. The required step is described in Ide et al. (Col. 4, Lines 37-45).

Claims 14-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,791,719 to Kobayashi et al. in view of U.S. Patent 6,32,211 to Terunuma et al. and in further view of U.S. Patent 6,303,392 to Matsukuma.

As applied above, Kobayashi and Terunuma disclose the method of the invention substantially as claimed but do not show the type of metal film used to mask the mask precursor layer. Kobayashi does teach that the metal mask may be a permalloy (Col. 3, Lines 45-50). Matsukuma teaches a method for forming such a permalloy mask including: nickel-iron, nickel-boron, nickel-phosphorus, copper, cobalt and other metals (Col. 6, Lines 10-13). It would have been obvious to one of ordinary skill in the art at the time of invention to use any of the alloys suggested by Matsukuma as a matter of selecting a permalloy from a list known in the art to be suitable for forming a mask. Selectively growing the film on a surface is considered analogous to plating as described in Matsukuma (Col. 6, Lines 13-15)

Claims 44-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,791,719 to Kobayashi et al. in view of U.S. Patent 6,32,211 to Terunuma et al. and in further view of Japanese Patent 11-312303 to Sasaki and U.S. Patent 6,0726,671 to Gill.

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Regarding claims 44-46, it would have been obvious to one of ordinary skill in the art at the time of invention to use iron nitride as the magnetic material or to use an amorphous alloy such as iron cobalt zirconium oxide since the materials are well-known for the purpose in the art as shown in Sasaki, paragraph 8, and Gill, claim 27.

Allowable Subject Matter

Claims 25, 26, and 34-42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art of record entirely fails to show or render obvious the second magnetic layer portion which covers an area of the thin film coil and magnetically coupled to the first magnetic layer portion.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberts Culbert whose telephone number is (703) 305-7965. The examiner can normally be reached on Monday-Friday (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

January 14, 2003


GREGORY MILLS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700